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(54) Combustible Compositions

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ABSTRACT OF THE DISCLOSURE

A combustible composition comprising a fuel in the form of a wax, gel or paste having expanded perlite dispersed therein serving to decrease the rate at which the fuel burns on combustion of the composition and optionally a combustible filter material, the composition being such that it does not flow substantially during combustion.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A combustible composition comprising a fuel in a form selected from the group consisting of waxes and pastes and having expanded perlite dispersed therein serving to decrease the rate at which the fuel burns on combustion of the composition, the composition being such that it does not flow substantially during combustion.

2. A combustible composition as claimed in claim 1 comprising a compacted mixture of a combustible organic solid, wax, and expanded perlite.

3. A combustible composition as claimed in claim 2 wherein the said combustible, organic solid is selected from the group consisting of wood waste, peat, waste plastics, coal fines, lignite, comminuted waste paper, cardboard, and comminuted plant material.

4. A combustible composition as claimed in claim 2 further comprising a combustible liquid.

5. A combustible composition as claimed in claim 1 comprising a gelled fuel, a combustible organic solid and expanded perlite.

6. A combustible composition as claimed in claim 5 wherein the said combustible, organic solid is selected

Claim 6 continued...

from the group consisting of wood waste, peat,waste plastics, coal fines, lignite, comminuted waste paper or cardboard, comminuted plant material.

7. A combustible composition as claimed in claim 1 and comprising expanded perlite and a water immiscible fuel emulsified with water to form a stiff paste.

8. A combustible composition as claimed in claim 1 wherein the expanded perlite has a bulk density of 40 to 60 kg/m^3 and has a particle size of 0.8 mm or less.

9. A combustible composition as claimed in claim 1 containing from 1 to 6% by weight of expanded perlite.

10. A combustible composition as claimed in claim 1, in a form selected from the group consisting of firelighter blocks, sachets, filled tubes, and firelogs.

FIELD OF THE INVENTION

The present invention relates to combustible compositions and includes compositions which in relatively small pieces are useful as firelighters as well as compositions which may be used to make artificial firelogs. The compositions of the invention may also be used as fuel.

BACKGROUND OF THE INVENTION

Known combustible compositions include those compositions which are used as firelighters, charcoal igniters and artificial firelogs. Certain of these compositions comprise fuel in the form of a wax, gel or paste, optionally filled with organic, combustible solids such as wood waste, (e.g. wood flour or wood shavings).

United States Patent Specification No. 4,165,968 discloses a gelled alcohol containing expanded perlite for the special purpose of forming a thin surface coating on charcoal briquettes to make them easily lightable. This alcohol gel composition would not be suitable for use in bulk as a firelighter because it would flow during combustion producing a large burning surface area and hence burning for only a short period. The purpose of the expanded perlite in the composition is to give the coating in charcoal a rough surface which acts as a wick to give easy ignition, rapid flame spread and hence an increased rate of fuel consumption.

We have found that the incorporation of inorganic solids into certain compositions which do not flow during

combustion, and which therefore are themselves useful as fuel, firelighters or barbeque starters, can produce a decrease in rate at which the fuel content of the combustible composition is consumed.

BRIEF DESCRIPTION OF THE INVENTION

The present invention now provides a combustible composition comprising a fuel in the form of a wax, gel or paste having expanded perlite dispersed therein serving to decrease the rate at which the fuel burns on combustion of the composition and optionally a combustible filler material, the composition being such that it does not flow substantially during combustion.

The fuel in wax, gel or paste form may for instance be an animal, mineral or vegetable wax, a gel formed from a combustible liquid or liquefiable material, e.g. a hydrocarbon such as kerosene or an alcohol, or a paste formed by emulsifying an oil in water.

DETAILED DESCRIPTION OF THE INVENTION

The combustible composition may accordingly comprise a compacted mixture of a combustible organic solid, such as wax, wood waste, and the expanded perlite. The wax which serves to bind such a composition together may be a solid or semi-solid wax. The composition may optionally contain a combustible liquid such as kerosene, distillate, gas oil, white spirit, sump oil or oils of vegetable origin such as may be used in the paints and plastics industries, and/or oils or fats of animal origin.

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Other fuel materials which may optionally be included from the plastics industry include waste polymers such as atactic polypropylene.

Compositions of the above type may be formed into large pieces suitable as artificial firelogs.

A further type of combustible composition according to the invention may comprise as well as the inorganic solid a gelled combustible liquid, e.g. a liquid hydrocarbon such as kerosene and/or vegetable or animal derived oils. The liquid may be gelled by means of a suitable thickener such as metal soap including aluminium stearates and octanoates, carboxymethyl cellulose, hydroxymethyl cellulose, hydroxypropyl cellulose, nitrocellulose, gums such as xanthan, arabic, tragacanth, shellacs, rosin, lignosulphates, tall oil cuts, quebracho extracts, caseinates, gelatin, higher alcohols, synthetic polymers such as polybutanols, ethylene copolymers, polyvinyl alcohols, polyvinyl acetate, vinyl cellulose, polyketones, polyesters, phenoxy resins, polymeric diols, vinyl butyral resins, vinyl acetate/polyvinyl chloride copolymers, N-cocohydroxybutyramide, polyamides and inorganics such as silica xerogel (known as "fumed silica"), thickening clays such as bentonite, laponite, montmorillonite and mixtures thereof. The gelling agent is selected such that the composition will not flow during combustion to a significant extent. The composition may contain a combustible organic solid such as wood waste peat or plastics waste.

Waxes may be incorporated into such compositions to act as additional fuel and in some cases to help bind the composition. Conventional products of this general type but lacking the expanded perlite characteristic of the invention are known as "brown firelighters".

Examples of compositions according to the invention include an alcohol gelled by the use of a thickener as described above, e.g. soap and/or silica xerogen (known as "fumed silica") as the fuel in combination with the inorganic solid. Kerosene or other hydrocarbon fuel or other oil may be used in place of the alcohol.

A further type of composition according to the invention may comprise the expanded perlite and a water-immiscible fuel e.g. hydrocarbon oil or other oil, emulsified with water to form a stiff paste, e.g. by the action of suitable emulsifying agents optionally in conjunction with application of high shear which has the effect of thickening the emulsion. Such an emulsion serves to provide the fuel in paste form.

Examples of inorganic, non-combustible particulate materials which may be used in conjunction with the expanded perlite are chalk, china clay, diatomaceous earth, perlite rock, sand, FILLITE which is a particulate solid separated from boiler ash and has the form of microspheres, vermiculite, talc, and exfoliated vermiculite.

Preferably, such an inorganic non-combustible particulate solid has low bulk density, for example less than 0.4 $g.cc^{-1}$.

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Preferably, the density of any such inorganic non-combustible particulate solid is similar to or less than that of the liquefiable fuel component. More preferably, the density of the solid is much less than that of the liquefiable fuel component.

Preferably, the particles of the expanded perlite and other inorganic non-combustible solids if present are impermeable to liquids, that is to say, the liquefiable fuel cannot completely penetrate the interior of the particles. This may be achieved by the use of solids that have a liquid-impermeable "skin" such as FILLITE, or by coating the particulate material with a barrier material which may be a polymeric coating composition such as an alkyd resin or nitro cellulose or a heavy metal soap, a silicone, or a silicate, or a viscous non-drying oil or a drying oil.

In order to minimise the opportunity for the expanded perlite to absorb liquid fuel it is preferred that the expanded perlite be added to the other ingredients shortly before the composition becomes too stiff to allow the introduction of the perlite.

It is preferred that the expanded perlite be of relatively small particle size, e.g. about 0.8 mm or less and of relatively low bulk density, e.g. from 40 to 60 kg/m^3. Johns Manville grade EUP/100/28 is of this preferred type.

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The amount of expanded perlite that may be included is up to 12% w/w of the total composition. Preferably, the amount is less than 8% w/w and 1% to 6% w/w is especially preferred.

The combustible composition may contain, in addition to the expanded perlite a proportion of combustible particulate material uniformly distributed therein. Typical of such materials are:- wood wastes including wood flour, wood shavings or comminuted compressed wood wastes; peat in dried native or dried and comminuted, precompressed form; coal fines; lignite; waste paper or cardboard; comminuted plant material such as comminuted compressed wastes from grain crops optionally partly hydrolysed, seeds such as linseed, rapeseed and millet which may be used whole or crushed, including oil-mill waste, or seed hulls such as coconut husk, walnut shells and peach stones preferably in comminuted form; or mixtures thereof. All things which contribute significantly to the calorific value of the end product be it firelighter, barbeque starter or artificial firelog may be used.

Generally, the proportion of such combustible solid material in the compositions of the invention will not exceed 80% by weight and more preferably will not be more than 70% by weight.

Preferably, the amount of expanded perlite included does not exceed 12% w/w based on the final product. In those cases where a particulate organic combustible material

is included, the amount of inorganic solid preferably does not exceed 8% w/w by weight of the final composition and is preferably 0.5% to 6% w/w.

The composition according to the invention may generally be used as firelighters or charcoal igniters. Those compositions which are not self-supporting solids may be put up in sachets to provide unit doses or may be filled into collapsible tubes for dispensing in such doses as are desired.

Those compositions possessing sufficient structural integrity may suitably be made into artificial firelogs.

The composition of the invention may be prepared in a variety of ways depending upon whether the final product is to be used as an ignition product for fires on the one hand or barbeque starters on the other hand or an artificial firelog. The manufacture of such product types is well understood and the incorporation of the expanded perlite may be effected by mixing at a suitable stage depending upon whether the final composition is to include a mechanical mixture of fuel and solid organic combustible material, a gelled fuel without wood waste or a brown firelighter type of product.

If the final product is to be of the first type, the expanded perlite, and any other inorganic materials, optionally precoated with surface treatment material, may be admixed together with or separately from the solid organic combustible material into the fuel with stirring

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usually at slightly elevated temperature especially in those cases where a relatively high melting point fuel is employed. In some cases it may be suitable to slurry the inorganic material optionally admixed with the fuel in liquid form and introduce them as fluid into the final blend.

Where the final product is to be a gelled product, preferably the gel is formed first from suitable components that is a thickener such as fumed silica or a soap and a fuel component in liquid form, for example an alcohol or kerosene. The inorganic component may then be admixed therewith with stirring to achieve uniform distribution. However, the inorganic solids may be dispersed in the fuel whilst it is in liquid form and then the mixture may be gelled by addition of soap or its formation in situ. It has been observed that the final product is often of stiffer consistency than the initially formed gel.

Preferably, when soap is used for the gelling, the soap is a saturated one since these give firmer gels. An Example of a preferred material is sodium stearate. Heavier metal soaps such as aluminium stearate may additionally or alternatively be used. The fuel does not have to be normally liquid and materials such as slack wax may be gelled with soap. Preferred proportions of fuel and soap are 3 to 25% by weight soap, more preferably 8 to 15% by weight soap, based on the weight of fuel and soap.

In the case of a brown firelighter type of final product where, for example kerosene or other combustible liquid is gelled as with a soap and mixed with wood waste to achieve a shape-retaining final solid that may be cut into blocks or moulded, the expanded perlite may be mixed with the gelling fuel component. Alternatively, the expanded perlite may be mixed with the fuel in liquid form and the mixture may be gelled by addition of soap or formation of soap in situ. The freshly formed composition may be allowed to stand until of satisfactory consistency if it is desired to be cut into blocks subsequently. Alternatively, the mixture may be moulded into individual blocks and wrapped when set to handlable consistency.

Another means of presenting the product is in sachets, i.e. sealed envelopes which closely fit the outer surfaces of the blocks when set.

Where such a composition is to be used as an artificial firelog suitably large pieces may be moulded as by extrusion or compaction and optionally wrapped.

Combustible compositions of the present invention are preferably match ignitable.

EXAMPLES

The invention will now be illustrated by the following Examples in which parts are by weight:-

Example 1

A kerosene-soap gel containing wood waste and expanded Perlite (Johns Manville Grade EUP/100/28) was

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prepared by heating a mixture of 72 parts kerosene and 10 parts stearic acid to 50°C until all the acid was dissolved using a propeller mixer.

3 parts of a 50% aqueous sodium hydroxide was then dissolved in the solution with stirring. To 83 parts of this mixture 17 parts premixed wood flour (15 parts) and expanded Perlite Grade EUP/100/28 (2 parts) were added in a dough mixer to mix with the above solution uniformly. The resultant suspension was poured into moulds and lightly tamped with a pallet knife and left overnight to set.

Firelighter sized fingers were cut from the block and had weight 40.0 g and size 30.5 x 62.5 x 28 mm.

Burning tests were conducted upon the firelighters so-produced in quadruplicate and a control lacking the perlite was run.

	Control	
Level of perlite present	None	2%
Mean finger weight	36.7 g	33.4 g
Mean observed burning time	12.0 min	16.7 min
%age kerosene in test sample	72.0	70.0
Weight kerosene per gram of finger	26.42 g	23.34 g
Burning time per g of kerosene	0.45 min	0.72 min

Thus the burning characteristics of brown firelighter fingers containing 2% expanded perlite are not impaired. Indeed a reduction of 9% in density results, an

increase in observed burning time occurs and the kerosene is more efficiently utilised.

Example 2

A typical artificial firelog composition was prepared by melting 72 parts SLACKWAX 30* and admixing with slow stirring 28 parts of a mixture of sawdust (26 parts) and expanded Perlite EUP/100/28 (2 parts) until uniform distribution was achieved.

The mixture was pressed into a mould as used in Example 1 and left to harden. Burning tests were conducted on fingers, cut from the moulded block when cold as in Example 1, for convenience and a control lacking perlite was run.

	Control	
Level of perlite present	None	2%
Mean finger weight	44.6 g	37.2 g
Mean observed burning time	19.6 min	18.8 min
%age slackwax in sample	72.0	70.0
Weight slackwax per g of finger	32.11 g	26.04 g
Burning time per g of slackwax	0.61 min	0.72 min

The inclusion of this grade of expanded perlite at 2% w/w level was found to reduce the density of the product by about 16% compared with the control; the observed burning time is not significantly impaired, however, the efficiency of utilisation slackwax is improved. Both products tended to drip slackwax slightly and were difficult to ignite with a match.

*Trade Mark

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A consideration of the above Examples show that the compositions of the invention tested exhibit various surprising advantages over the controls.

First it has been found that a large reduction in density of the combustible composition may result from the addition of expanded perlite. Thus, in the case of a wax/wood waste composition (Example 2) up to 9% reduction in density occurs in blocks suitable for artificial fire-logs and containing little or no kerosene whilst the observed burn time (duration of burn in minutes per unit size of block of material) seems not to be reduced indicating an improvement in the efficiency in the utilisation of the liquefiable fuel per unit-volume of product.

The reduction in density is in itself advantageous since the bigger product may be produced without using extra fuel or the existing size of product may be maintained with a fuel saving.

The corresponding reduction in density of an ignition product for use as a firelighter and prepared from an otherwise typical brown firelighter composition (Example 1) is roughly 9% on addition of 2% w/w expanded perlite and the observed burning time was substantially increased emphasising the increased efficiency of burning of the liquefiable fuel of incorporation of relatively low concentration of expanded perlite.

Whilst in many cases the incorporation of expanded perlite improves the efficiency of burning of the fuel,

it is at present not clear how this effect is achieved. It could be due to the structure of the expanded perlite. In the case of the more solid compositions, the perlite may merely provide a more or less rigid structure within a burning block preventing the slight shrinkage effect which normally accompanies collapse of the block during burning, with consequent improvement of burning. Solid blocks exemplified above show an efficiency of fuel burning which tends towards the efficiency of so-called "white firelighter" in burning liquefiable fuel.

"White firelighter" is the term usually used for a firelighter composition having kerosene in liquid form encapsulated in tiny pores in a matrix of solid resin.

Again it may be due to a heat insulative effect of the perlite causing reduced heat flow to the fuel in the interior of the block resulting in a reduced rate of vaporisation at the burning surface, or some combination of these effects.

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SUBSTITUTE

REMPLACEMENT

SECTION is not Present

Cette Section est Absente